



NASA SBIR 2004 Phase I Solicitation

E2.05 Energy Storage Technologies

Lead Center: GRC

Participating Center(s): GSFC, JPL, JSC, MSFC

Advanced energy storage technologies are required for Earth science observation platforms. These platforms are defined as host systems that include traditional spacecraft, airborne platforms, such as piloted and unpiloted aircraft and balloons, terrestrial platforms, micro-spacecraft, and surface penetrators.

The energy storage technologies solicited include both primary and secondary batteries, primary and regenerative fuel cells, and flywheels. The desired technology advances common to all of the storage devices of interest include the following elements:

- Improvements in energy density and specific energy;
- Improvement in cycle life, run time, and calendar life;
- Performance over a wide temperature range;
- Reduction in device size, to the micro-scale;
- Reduction in system complexity; and
- Integration into, and with, other spacecraft structures.

A vigorous effort is needed to develop energy storage technologies that will enable the revolutionary ES missions.

Specific technology advances that contribute to achieving the following performance goals are of interest.

Advanced Battery Technology

- Specific energy: >150 Wh/kg for secondary batteries >400 Wh/kg for primary batteries
- Low-Earth-Orbit (LEO) cycle life >60,000 cycles for secondary batteries
- Calendar life >15 years
- Operating temperature range -100Â°C to 100Â°C

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- Systems capable of delivering 30%–50% of the capacity available at ambient temperatures at temperatures as low as -100°C

Primary and rechargeable lithium-based batteries with advanced anode and cathode materials and advanced liquid and polymer electrolytes are of particular interest. Proposals addressing structural and microbatteries are sought.

Fuel cell (FC) and Regenerative Fuel Cell (RFC) Technologies

- Specific energy: FC >1500 W/kg, RFC >600 Wh/kg
- Efficiency: FC >70% at 1500 W/kg, RFC >60% at 600 Wh/kg
- Life FC >10,000 hours, RFC > 1500 cycles

Advances to PEM, Direct methanol and solid oxide fuel cell systems are of particular interest.

Flywheel Energy Storage

- Specific energy > 100 Wh/kg
- LEO cycle life > 60,000 cycles

Micro-flywheels with a high number of watt hours per kilogram and highly integrated components are of particular interest.